# Abstract

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**Title:** **Traumatic brain injury – intracranial hypertension**

Graduation thesis

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Healthcare bioanalytics

***The aim:***

The aim of this graduation theses was the background research of the special literature and information resources, which are consist of intracranial hypertension. In the graduation theses we definied intracranial hypertension and also we noticed the description of the pathophysiological mechanisms generation intracranial hypertension.

***Main knowledge:***

Intracranial hypertension is one of the most important pathophysiological mechanisms, which in principle influence the prognosis of the patient after the brain injury. On the development of the intracranial hypertension after brain trauma it is most ofen shared intracranial bleeding, cerebral oedema or failure of the cerebrospinal fluid. Adult person in the recumbency has got normal values ICP between 7-15 mmHg. Values ICP which are higher than 20mmHg are generally accepting as pathological. Intracranial hypertension contributes to the reduction cerebral perfusion pressure, which is important for the preservation of the blood running in all brain areas. Reducted cerebral perfusion pressure leads to the ischemia of the brain.

The main aim of this thesis was the knowledge collecting concerning monitoring of the patients with intracranial hypertension and therapeutic affecting of the intracranial hypertension.

By the patients with intracranial hypertension is necessary to do multimodal monitoring, which is possible to divide into basic and special.

Basic multimodal monitoring includes measurement of the pulse and breathing frequence of the intracranial pressure and next values, which are currently monitored also by different traumatic states. Also the neurological state is evaluated by the help of

the Glasgow coma scale (GCS). Next it is evaluated the state of the pupils, position of the eyebulbs and motoric answers of the limbs. For the monitoring of the intracranial pressure exist several types of the catheters: intraventricular, subarachnoid, subdural, epidural and intraparenchymal. The gold standard in the measurement of the intracranial pressure represents intraventricular catheter, which provides most exact values ICP. Next it is very often used intraparenchymal catheter, which is easy taken into and provides high-quality results. The other types of the catheters are used rarely.

In the frame of the multimodal monitoring is observed partial pressure of the oxygene in the brain tissue, cerebral blood flow and brain metabolism. Monitoring of the brain oxygenation is very important for the understanding and prevention the neurological complications. Insufficient brain oxygenation causes hypoxie, which leads to the secondary brain damage. About the delivery of the oxygen into the brain inform directly by the patient´s bed jugular oximetry, near-infrared spectroscopy or measurement of the partial pressure in the brain tissue. The most widespread method is the jugular oximetry, which is based on the measurement of the saturation the venous blood by the help of the catheter with fibre optics leads into the jugular bulb.

The most often used method in the intensive care for the monitoring cerebral blood flow (CBF) is the transcranial doppler ultrasonography, which makes possible non-invasive measurement of the flow in the intracrainal arteries over the intact skull. Further also laser doppler flowmetry is started to use.

Metabolism of the brain is possible to monitored by the help of the cerebral microdialysis, which is an invasive method, which provides on-line biochemistry analysis of the brain tissue. Next for the monitoring of the brain metabolism is used MR spectrometry, single proton emission computed tomography (SPECT) and positron emission tomography (PET).

The aim of the medical treatment is ensured adequate perfusion of the brain tissue, prevented from hypoxic brain damage and herniation brain tissue. During the treatment of the intracranial hypertension at first it is very important to give and then keep up extracranial homeostasis of the organism. It presents to keep up the optimal oxygenation, complete resuscitation of the circulation, affecting of the body temperature in the direction to the normothermia, adequate analgosedation alternatively myorelaxation etc. Sedation and analgesia are important because the motoric discomposure and painful percepts of the ill person increase ICP. Myorelaxation has got an importance by the soften down the ill person.

In the case that the inracranial pressure is monitored intravetricular, is the method of the first choice the evacuation of the cerebrospinal fluid. Evacuation of the several milliliters of the cerebrospinal fluids can very dramatically bring down ICP. In the case that the evacuation of the cerebrospinal fluids does not lead to the reduction ICP or it is not available can be used a possibility of application osmotically active substances – mannitol or hypertonic saline NaCl. Reduction of ICP after giving osmotically active substance is most probably result of the improvement the reological qualities of blood and osmotically effect, which leads to the reduction volume of the water in the brain. Next is observed influence of the barbiturates and glucocorticoids for the reduction ICP.

In the case that the increased ICP does not correspond to the conservative treatment, it is proceeded to a surgical intervention. Between the neurosurgial possibilities of the treatment the intracranial hypertension belong to the evacuation of the cerebrospinal fluid, ablation of the pathological increased volume of the tissue or decompressive craniotomy. Decompressive craniotomy is a surgery major, whereat the part of the skull is removed and that is extended the intradural area in order to bring down ICP. This type of the surgery is made in the majority of the workplaces and it is indicated as the osteoclastic decompressive craniotomy (decompressive craniectomy). By this method after fall-back of the intracranial hypertension must be realized replantation of the bone plate. It begins to appear the new type of the decompressive craniotomy which is indicated as an osteoplastic decompressive craniotomy, when is the free bone plate left in the place. After going off the oedema the bone plate will lie back and will heal. It is not necessary to do the replantaion and the patient will comply with the next surgery, that the time of the sickness absence is shorter and also the risk of the contingent complications.

## ***Conclusions:***

Intracranial hypertension introduces the basic medical science problem, which is not concerned only neurology and neurosurgery but also many other fields of knowledge and in principle influences prognosis of the patient. That is why it is extremely important to give an attention paid to intracranial hypertension because it directly threatens the patient on his life. Therefore the new methods of monitoring which lead to early detection the intracranial hypertension and first of all therapeutic processes for its managing are still implemented.